

WHAT IS CLAIMED IS:

1. A method of fabricating a semiconductor device comprising:
forming a first layer on a semiconductor element;
forming a second layer on said first layer, said second layer being made of a material, an etching rate of which changes in accordance with kind and concentration of dopant atoms implanted therein;
implanting dopant atoms into said second layer;
forming a third layer on said second layer;
forming one or more first openings in said third layer;
etching said second layer using said third layer as a first mask, thereby forming one or more second openings in said second layer; and
forming one or more contact holes in said first layer using at least said second layer as a second mask.
2. The method according to claim 1, wherein said first mask used in said forming process of one or more contact holes has a multilayer structure including said second layer and said third layer.
3. The method according to claim 1, further comprising:
annealing said second layer after said implanting process of dopant atoms, thereby activating said dopant atoms.

4. The method according to claim 1, wherein

said forming process of one or more first openings is performed in such a way that a plurality of said first openings with the same diameter are formed in said third layer;

said forming process of one or more second openings is performed in such a way that a plurality of said second openings with different diameters are formed in said second layer; and

said forming process of one or more contact holes is performed in such a way that a plurality of said contact holes include at least one large-diameter contact hole and at least one small-diameter contact hole.

5. The method according to claim 4, wherein

said implanting process of dopant atoms is performed in such a way that said dopant atoms are implanted into said second layer inside a specific area and not implanted into said second layer outside said specific area; and

said forming process of one or more first openings is performed in such a way that at least one of said first openings is formed in said third layer inside said specific area and the rest of said first openings is formed in said third layer outside said specific area.

6. The method according to claim 4, wherein

said implanting process of dopant atoms is performed in such a way that said dopant atoms include first dopant atoms and second dopant atoms different from said first dopant atoms, said first dopant atoms are implanted into said second layer inside said specific area, and said second dopant atoms are implanted into said second layer outside said specific area; and

said forming process of one or more first openings is performed in such a way that at least one of said first openings is formed in said third layer inside said specific area and the rest of said first openings is formed in said third layer outside said specific area.

7. The method according to claim 4, wherein said implanting process of dopant atoms is performed in such a way that said dopant atoms are implanted into a whole area of said second layer.

8. The method according to claim 1, wherein said first layer is an interlayer insulating film.

9. The method according to claim 1, wherein said second layer is a polysilicon layer.

10. The method according to claim 1, wherein said second layer is formed of dielectric material.

11. The method according to claim 1, wherein said third layer is a resist layer.

12. The method according to claim 1, wherein said forming process of one or more first openings in said third layer is performed using photolithography.

13. The method according to claim 1, wherein said dopant atoms are either group V atoms or group III atoms.

14. The method according to claim 6, wherein said first dopant atoms are group V atoms and said second dopant atoms are group III atoms.

15. The method according to claim 4, wherein:
said semiconductor element has a gate, a source and a drain;
said large-diameter contact hole is formed directly above said gate; and
said small-diameter contact holes are formed directly above at least one of said source and said drain.